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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/529,486	01/13/2006	Gijsbertus Rietveld	2001-1381	6763

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EXAMINER	
WILLIAMS, SHERMANDA L	

ART UNIT	PAPER NUMBER
1745	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/22/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

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Office Action Summary	Application No.	Applicant(s)
	10/529,486	RIETVELD ET AL.
	Examiner	Art Unit
	Shermanda L. Williams	1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 March 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *17-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *17-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 March 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *3/28/2005*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

The information disclosure statement (IDS) submitted on 3/28/05 has been placed in the application file, and the examiner has considered the information referred to therein.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 17, 18, 20, 21, 22, 23, 24, are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. (US 2003/0082434 A1) in view of Visco et al. (US 2003/0059668 A1). Wang et al. teaches a cathode supported solid oxide fuel cell with interconnectors. The cathode is comprised of lanthanum strontium manganate (LSM) and is supported by a substrate (paragraph 15, 48). The active nickel containing anode layer has a thickness of 5 to 50 microns, preferably 10 to 20 microns (45). The SOFC is comprised of three main layers: an anode, an electrolyte, and a cathode (paragraph 21).

Wang et al. does not teach that the cathode support material comprises a porous alloy made with iron and chromium.

4. Visco et al. teaches structures and techniques for solid-state electrochemical devices to include solid oxide fuel cells (SOFC) (paragraph 6, 16). The anode and cathode electrodes and the electrolyte are supported by the substrate or support material (paragraph 4, 34). Visco et al. teaches a porous substrate constructed from one or more transitional metals to include Cr, Fe, Cu, and Ag, or alloys thereof (paragraph 12). Visco discloses forming the electrodes and the electrolyte on the substrate and co-firing or sintering the layered structure (paragraph 12, 14, 32). The air electrode or cathode is formed from LSM (paragraph 43).

5. Visco et al. teaches that the substrate or support material may be cermet composed of Al_2O_3 and iron containing Inconel ® (paragraph 53). Alternatively, Visco et al. also teaches that the other metals and alloys such as Cr, Fe, A, and /or alloys such as low-chromium ferritic steels, intermediate-chromium ferritic steels, and high-chromium ferritic steels (paragraph 54).

6. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the cathode supported SOFC of Wang et al. to include a support material comprised of a porous alloy made with iron and chromium due to the added conductivity provided by the metals and stability of the metals in the oxidizing environment of a SOFC as taught by Visco et al. (paragraph 35).

7. Claims 25, 26, 30, 31, and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. (US 2003/0082434 A1) in view of Visco et al. (US

2003/0059668 A1). Wang et al. teaches a cathode supported solid oxide fuel cell with interconnectors. The cathode is comprised of lanthanum strontium manganate (LSM) and is supported by a substrate (paragraph 15, 48). The active nickel containing anode layer has a thickness of 5 to 50 microns, preferably 10 to 20 microns (45). Wang et al. does not teach the sintering a powder at a temperature between 1200°C and 2000 °C for the cathode/support material combination or the presence of stainless steel in the cathode support material.

8. Visco et al. discloses structures and techniques for solid state electrochemical devices to include solid oxide fuel cells (paragraph 6, 16). The SOFC is comprised of an anode, electrolyte, and a cathode (paragraph 38). The anode and cathode electrodes and the electrolyte are supported by the substrate or support material (paragraph 4, 34). Visco et al. teaches a porous substrate constructed from one or more transitional metals to include Cr, Fe, Cu, and Ag, or alloys thereof (paragraph 12). The chrome steel alloy of the substrate is made with powder (paragraph 35).

9. Visco et al. teaches forming the electrode/membrane/electrolyte on the substrate and co-firing or sintering the layered structure (paragraph 12, 14, 32). The chrome steel alloy substrate is powder and is sintered (paragraph 35). The sinter process takes place at a temperature between 1200°C and 1500 °C (paragraph 58). The support material or substrate is comprised of ferritic or stainless steel (paragraph 54). The electrode materials are screen printed onto the electrolyte (paragraph 38).

10. With respect to claim 32, Visco et al. teaches that the substrate or support material may be cermet composed of Al_2O_3 and iron containing Inconel ® (paragraph

53). The particle size of the substrate or support material is less than about 100 microns. Alternatively, Visco et al. also teaches that the other metals and alloys such as Cr, Fe, A, and /or alloys such as low-chromium ferritic steels, intermediate-chromium ferritic steels, and high-chromium ferritic steels, and alloys such as Cr5Fe1Y (paragraph 54). Ferritic steel is a type of stainless steel with a desirable ductility.

11. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of making the cathode supported SOFC of Wang et al. to include stainless steel in the cathode support material and to sinter the cathode/support material combination at a temperature between 1200°C and 2000 °C such as taught by Visco et al. in order to form a single coherent assembly comprised of the cathode material and the stainless steel containing support or substrate material.

12. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. in view of Visco et al. applied to claim 17, and further in view of Kim et al. (US 6,228,521 B1). The disclosure of Wang et al. in view of Visco et al. as discussed above is incorporated herein. Wang et al. in view of Visco et al. teaches a SOFC comprised of an anode, electrolyte, and a supported cathode. Wang et al. in view of Visco et al. does not teach the electrolyte thickness.

13. Kim et al. teaches a high power density solid oxide fuel cell having a graded anode. The anode is comprised of nickel oxide (col. 4 lines 59-63) and the electrolyte has a thickness of about 10 micrometers (col. 8 lines 23-27). The use of nickel/nickel oxide in the anode allows easy transport of fuel gases due to the porosity of the nickel anode (col. 1 lines 15-20). This in turns improves the power density of the cell. It

would have been obvious to one having ordinary skill in the art at the time the invention was made to modify electrolyte thickness of the fuel cell of Wang et al. in view of Visco et al. to include an electrolyte with a thickness of less than 10 micrometers such as taught by Kim et al. The fuel cell power density is increased due to the reduction in weight that results from employing a thinner electrolyte layer.

14. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Want et al. in view of Visco et al. as applied to claim 25 above, and further in view of Third et al. (US 5,592,686). The disclosure of Wang et al in view of Visco et al. as discussed above is incorporated herein. Wang et al. in view Visco et al. does not specifically teach the casting of a powder as a suspension and then sintering the suspension.

15. Third et al. teaches a process for the formation of engineered porous metal structures having a controlled micro-porosity and macro-porosity. The porous metal structures include battery material and electronic and electrical components (col. 1 lines 5-20). The process teaches a colloidal suspension comprising at least one metal powder having a median particle size less than 300 microns. The suspension is casted and sintered (col. 2 lines 39-60). This process improves the mechanical strength, formability, and flexibility of the structure prior to sintering (col. 2 lines 61-64). The process is useful for the production of thin walled structures (col. 4 lines 27-28).

16. Claim 7 of Third et al. recites that the metal powder may be iron or composite powders or mixtures thereof. Third et al. is analogous art because it is from the same field of endeavor, the formation of a porous metal structure from a metal powder. It would have been obvious to one having ordinary skill in the art at the time the invention

was made to modify the cathode electrode support method of making of Wang et al. in view of Visco et al. to include the step of casting the powder as suspension and then sintering the material such as taught by Third et al. in order to increase the mechanical strength of the unsintered material and to form a metal support material having a controlled micro-porosity as taught by Third et al.

17. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. in view of Visco et al. as applied to claim 25 above, and further in view of Shinkai et al. (US 6, 187, 468 B1). The disclosure of Wang et al. in view of Visco et al. as discussed above is incorporated herein. Wang et al. in view of Visco et al. does not specifically teach a printing technique for the application of the cathode material.

18. Shinkai et al. teaches an electrode for a fuel cell. The electrode material is applied to the support material by using a screen-printing technique (col. 10 lines 33-36). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the cathode material application process of Wang et al. in view of Visco et al. to include using a printing technique to apply the cathode material to the support substrate or material such as taught by Shinkai et al. in order to adjust the thickness of the cathode electrode as taught by Shinkai et al.

19. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. in view of Visco et al. as applied to claim 25 above, and further in view of Mardilovich et al. (US 7,153,601 B2). The disclosure of Wang et al. in view of Visco et al. as discussed above is incorporated herein. Wang et al. in view of Visco et al. does

not specifically teach a spin coating technique for the application of the cathode material.

20. Mardilovich et al. teaches a fuel cell with embedded current collectors. Mardilovich et al. teaches that the depositing of the electrolyte, anode material, or the cathode material layers may be completed by the spin coating technique (col. 10 lines 25-31). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the electrolyte depositing process of Wang et al. in view of Visco et al. to include using the spin coating technique to apply the electrolyte layer to the cathode material layer such as taught by Mardilovich et al. due to the simplicity of the spin coating application technique.

21. Alternatively, Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. in view of Visco et al. as applied to claim 25 above, and further in view of LaFollette et al. (US 6,610,440 B1). The disclosure of Wang et al. in view of Visco et al. as discussed above is incorporated herein. Wang et al. in view of Visco et al. does not specifically teach a spin coating technique for the application of the cathode material.

22. LaFollette et al. teaches the construction of microscopic batteries for microelectromehcanical systems. LaFollette et al. also teaches that spin coating is the application of a liquid coating to a substrate using centrifugal force and allows for even coating (col. 20 lines 53-56). The electrode material of LaFollette et al. is layered in thin layers via a spin coating technique onto a substrate (col. 20 lines 53-56; col. 21 lines 3-8). It would have been obvious to one having ordinary skill in the art at the time the

invention was made to modify the electrolyte depositing process of Wang et al. in view of Visco et al. to include using the spin coating technique to apply the electrolyte layer to the cathode material layer such as taught by LaFollette et al. due to the controllability afforded by the spin coating method to spread the electrolyte evenly over the cathode material (col. 20 lines 53-56).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shermanda L. Williams whose telephone number is (571) 272-8915. The examiner can normally be reached on Mon.-Thurs. 7 AM - 4:30 PM and alternating Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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Susy Tsang Foster

SUSY TSANG-FOSTER
PRIMARY EXAMINER